

85640

S/064/60/000/006/001/011
B020/B054

15-8115

AUTHOR:

Berlin, A. A.

TITLE:

Synthesis and Properties of Polymers With a System of
Conjugate Bonds

PERIODICAL: Khimicheskaya promyshlennost', 1960, No. 6, pp. 6-14

TEXT: The present paper deals with polymers with aromatic nuclei which are bound to one another either directly or by such groups or atoms as to guarantee a continuity of the conjugate π -electron chain. The accumulation of benzene nuclei in the macromolecules may lead to the formation of linear, linear-annular, angular-annular, ramified, flat ("aromatic parquet"), or three-dimensional structures. With an increasing number of bound aromatic nuclei, the melting point and the thermostability of molecules with linear structure increase, while their solubility falls. An introduction of methyl groups lowers the melting point, and improves the solubility in aromatic hydrocarbons. For the production of highly heat-resistant polymers, those with graphite-like structure are most interesting therefore, the study of synthesis and properties of linear polyphenylenes

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and polymers with graphite-like structure seems to be most important. This synthesis can be performed either by conversion of low-molecular aromatic compounds, or by intramolecular destructive cyclization of certain acyclic high polymers, or by dehydrogenation of polymers which contain bound alicyclic groups. A perfluoro polyphenylene obtained from p-dibromo- or diiodo tetrafluoro benzene is particularly heat resistant. Polyphenylenes are sparingly soluble in aromatic hydrocarbons, and show an anomalous dependence of η/c on c . The high temperature coefficient of solubility, the anomalous viscosity, and the dependence of the intrinsic viscosity on the displacement velocity, as well as the unmeltability show that the polymers consist of relatively short, but strongly associated, solid, almost linear macromolecules. An introduction of methyl groups in the polyphenylene chain changes the properties of polymers considerably. The integral and differential curves for the distribution of the highest-molecular fraction of polymethyl phenylene show that the fraction contains small amounts of products with molecular weights of up to 300,000. The author describes the production of linear or poorly ramified polymeric aromatic compounds by reaction of Cu^{1+} with benzidine bisdiazonium, the effect of azo groups in polyphenylene polyazo compounds and their

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viscosity, the paramagnetic electron resonance of these compounds and their electrophilic properties, the transition of polyphenylenes on heating from the singlet- to the triplet state, the synthesis of polymers with heteroatoms in the benzene ring from aromatic diazonium compounds and their properties, the synthesis of polyphenylene oxides by oxidation of 2,6-disubstituted phenols with oxygen in the presence of CH_2Cl_2 and pyridine, the synthesis of aromatic polymers with a conjugate quinone group and with amino groups and their properties. Further, he deals with polymers with hetero- and metal cycles in the conjugate chain. Fig. 4 shows the temperature dependence of the specific electrical conductivity of thermolyzed polyacrylonitrile, and Fig. 5 the temperature dependence of the electrical conductivity of a polymeric chelate complex of ethylene percyanide with iron. The author mentions V. Vansyatskiy, as well as V. A. Tal'roze of the Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics of the AS USSR). There are 5 figures and 48 references: 17 Soviet, 16 US, 6 German, 4 British, 1 Italian, 1 Swedish, 1 Swiss, 1 Australian, and 1 Belgian. ✓

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84288

15.9900 2109, 2209, 1524

11.2211

S/138/60/000/006/001/008
A051/A029

AUTHORS: Berlin, A.A., Khanukayeva, I.A.

TITLE: The Production and Main Properties of Grafted Copolymers of Styrene and Rubber.

PERIODICAL: Kauchuk i Rezina, 1960, No. 6, pp. 20 - 22.

TEXT: The article presents the results of an investigation on grafted copolymerization of synthetic rubbers and styrene in aqueous dispersions (latexes) and a solution of the polymer in the monomer. The methods of conducting grafted copolymerization in heterogenous dispersion systems of polymers and monomers in various liquid mediums have been developed only slightly. The author has previously published an article on the subject (Ref. 7). Butadiene-styrene CKC-30 (SKS-30) and butadiene-acrylonitrile latexes of CKH-18 (SKN-18), CKH-26 (SKN-16), and CKH-40 (SKN-40) rubbers were taken for the investigation. Table 1 shows the results of the comparative characteristics of the rubber and styrene copolymer (in the ratio 33:66), and the mechanical mixture of a similar composition and the initial components. Table 2 gives the figures on the main physico-mechanical pro-

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S/138/60/000/006/001/008
A051/A029

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properties of the products of the interaction between the styrene and rubber. The data show that during the reaction an initiated destruction of the rubber and the formation of branched structures takes place. An investigation of the thermomechanical properties showed that the formation of branched structures somewhat decreases the vitrification temperature and the thermostability according to Martens (75 - 78°C instead of 80 - 85°C), but increases the temperature range of the highly elastic state and the temperature of transference to the viscous-fluid state (Ref. 7). The styrene copolymers grafted with butadiene-styrene rubber are not inferior to the so-called latex polystyrene as to their dielectric properties and have a higher resistance. It is noted that a comparatively large amount of rubber is required in the grafted copolymerization in latexes of synthetic rubbers. Apparently in this process the chain transference process takes place with a lack of intensity for the following two reasons: 1) incomplete contact between the rubber particles covered with the emulsifier and the monomer, 2) the presence of antioxidant admixtures, disrupting the growing chains. When conducting grafted copolymerization in the mass, the conditions are

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more favorable due to a better contact of the ingredients and because preliminary purification of the rubber from admixtures is possible. The authors point out that by developing a method for grafted copolymerization of styrene and rubber the amount of elastomer would be reduced and a more tensile and durable product could be produced under atmospheric conditions. The principle used in Reference 1 by the author in solving this problem is outlined. An investigation of the mechanical properties of the grafted copolymers obtained by this method showed that even in the case of a small amount of rubber added plastics with rather high mechanical properties could be produced (Table 3). It becomes apparent that with an increase in the rubber latex (under given experimental conditions) the dispersion and the stability of the styrene emulsion increase, which facilitates the contact between the components and renders their interaction more effective. This, in turn, leads to the formation of the grafted copolymer. There are 3 tables, 2 figures and 7 references: 6 Soviet and 1 American.

ASSOCIATION: Institut khimicheskoy fiziki Akademii Nauk SSSR. Kuskovskiy Khimzavod (Institute of Chemical Physics, AS USSR. Kusov Chemical Plant).

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BERLIN, A.A.

Synthesis and properties of polymers with a conjugated bond
system. Khim. prom. no. 6:444-452 8 '60. (MIRA 13:11)
(Polymers)

20250

15.9201 2209

S/138/60/000/012/001/009
A051/A027

AUTHORS: Berlin, A.A., Gil'man, I.M.

TITLE: The Production and Properties of Block-Copolymers Formed in the Mastication of Rubber and Polystyrene Mixtures

PERIODICAL: Kauchuk i rezina, 1960, No.12, pp. 1-3

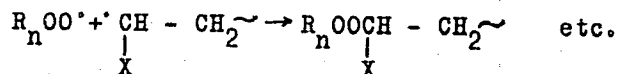
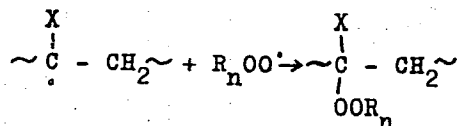
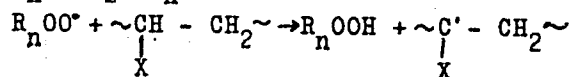
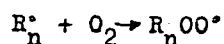
TEXT: The authors have investigated the main physico-mechanical properties of materials produced in the mastication of polystyrene and various elastomer mixtures. Mention is made of the favorable conditions of block-copolymer formation, especially in an inert gas medium, during mastication of polymer mixtures. It is stated that the mechanism of this reaction cannot be explained by poly-recombination of the radicals alone, since in this case the chain reaction has the greatest significance, leading to the formation of block-copolymers and branched macromolecules (Ref.1). The authors consider that the peroxide macroradicals formed by interaction with O_2 due to the chain nature of the mechano-chemical block-copolymerization process can serve as active components taking part in the formation of the block-copolymers: X

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The Production and Properties of Block-Copolymers Formed in the Mastication of Rubber and Polystyrene Mixtures



Mastication in an air medium on rollers was performed (friction number 1.25, $t=150-160^\circ\text{C}$) using mixtures of polystyrene (block-type average molecular weight $M_{av} = 80.000$ and emulsion-type, $M_{av} = 200.000$) with butadiene CK6

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(SKB), butadiene-styrene CKC-30 (SKS-30), butadiene-acrylonitrile CKH-18, CKH-40 (SKN-18, SKN-40) rubbers, polyethylene ($M_{av} = 200.000$), polyisobutylene ($M_{av} = 200.000$), butyl rubber and chloroprene rubber. It was noted that materials with the greatest specific toughness and static bending resistance were formed from the combined mastication of polystyrene A mixtures with 20-25% synthetic rubbers of the SKS-30 and SKN-18 type (Fig.1). Masticated rubbers produced on an emulsified polystyrene and SKS-30 rubber (25%) base are characterized on the average by the following figures: specific toughness, $kg \cdot cm/cm^2$ 53-60, static bending resistance, kg/cm^2 930, heat resistance according to Martens, $^{\circ}C$... 86, tangent of the angle of dielectric losses at 10^6 cycles... 0.0019, water absorption per hour, g/dm^2 ...0.01. The authors point out that the development of the mechano-chemical theory on block-copolymerization in the rolling of polymer mixtures helps to explain the observed drop in the stability of the material when adding a radical acceptor (J_2) and also certain dyes on the rollers. It is concluded that the introduction of these dyes and the

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radical acceptors lower the stability of the material probably due to an inactivation of the macroradical parts formed during the mechanical destruction of the polymer chains. There are 2 tables, 1 graph and 6 references: 5 Soviet, 1 English.

ASSOCIATION: Kurskiy Khimicheskiy zavod (Kursk Chemical Plant).

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87642

S/191/60/000/012/001/016
B020/B066

11.2210 also 2209,

AUTHORS: Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin, V.A.

TITLE: Impact-resistant Polyvinyl Chloride

PERIODICAL: Plasticheskiye massy, 1960, No. 12, pp. 2 - 3

TEXT: Heat resistance and impact of PVC are comparatively low which considerably confines its range of applicability in spite of its other good properties. It is possible to increase the impact strength of PVC by synthesizing vinyl chloride polymers grafted with various rubbers, by means of a chain transfer reaction. The mechanical properties of Viniplasts obtained by this method are, however, no better than those of Viniplast made of PVC. The present paper investigates the physical and thermomechanical properties of Viniplast obtained from compositions consisting of PVC coplasticized with a polar synthetic rubber (PSR). Owing to interaction of functional groups of PVC with the rubber, interlaced structures of grafted copolymers are formed. PVC was mixed with stabilizers (litharge, calcium stearate) which were hot-rolled along with the adequate amount of PSR. Plates were cut from thin foils of the rolled

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Impact-resistant Polyvinyl Chloride

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material, and a stack of them was hot-pressed. In the test of Viniplast containing 10% PSR of different types, its physical and mechanical properties ranged within the following limits: specific impact strength from 57.2 to 84.8 kg·cm/cm² (8.6 for initial PVC); maximum tensile strength from 397 to 530 kg·cm² (550 for PVC); vitrification point between 76 and 80°C (75°C for PVC). The addition of 10% PSR to the Viniplast, thus, increases the specific impact strength up to the 6 to 10 fold, whereas the tensile strength is somewhat reduced, and the vitrification point is maintained. The dependence of the specific impact strength, tensile strength and relative elongation on the rubber content in Viniplast was investigated (Figs.1-3). The optimum ratio of PVC:PSR for obtaining Viniplast with high specific impact strength is 90:10 (Fig.1). The introduction of 2.5% rubber increases the impact strength of Viniplast to the threefold. At a rubber content of 15 - 50%, Viniplast samples were not destroyed in the impact test owing to their high elasticity. With increasing rubber content, tensile strength and relative elongation of the material (Figs.2,3) decrease, and the surface of Viniplast becomes uneven and rough, beginning from a rubber addition of 25 - 30%. The temperature dependence of the specific impact strength

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of impact-resistant Viniplast was studied in a range of from -60° to $+60^{\circ}$ C, and it was found that a Viniplast with 5 and 10% PSR exceeds a Viniplast from PVC even at a temperature below 0° C. The specific properties of impact-resistant Viniplast become particularly manifest at room temperature. The absolute value of the specific impact strength could only be determined at temperatures below zero. Table 1 gives comparative data of this factor obtained on compositions with 90% PVC and 10% PSR, and on PVC samples. The principal physical and thermomechanical properties of impact-resistant Viniplast, as well as of PVC-Viniplast, are presented in Table 2. There are 4 figures, 2 tables, and 1 Soviet reference.

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83818

15.8106 *also 2209*

S/190/60/002/005/008/015
B004/B067

AUTHORS: Berlin, A. A., Liogon'kiy, B. I., Parini, V. P.
TITLE: Production and Properties of Some Aromatic Polymers 1
PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 5,
pp. 689-697

TEXT: In an earlier paper A. A. Berlin and V. P. Parini published the synthesis of homologous polyphenyl series by decomposing bis-diazobenzidine or bis-diazobenzidine-3,3'-dicarboxylic acid by means of salts of monovalent copper (Ref. 11). The present paper reports on this reaction and on the properties of the products obtained. The bis-diazo compounds were decomposed with an ammoniacal solution of copper sulfate, which had been stabilized with hydroxylamine hydrochloride. No different results were obtained with air supply or in argon atmosphere. An addition of the diazo solution to the copper solution, however, yielded products with higher molecular weight than those obtained in the inverse process. Analyses of the products obtained are given in Table 1. Nitrogen could not be completely removed. The chlorine content decreased with increasing

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Production and Properties of Some Aromatic
Polymers

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molecular weight (Table 2). So, it is probably bound to the end group. The following polymer structure is assumed: $\text{Cl}-\left[\begin{array}{c} \text{C}_6\text{H}_3 \\ \text{R} \end{array}\right]_x-\text{C}_6\text{H}_3-\text{N}=\text{N}-\left[\begin{array}{c} \text{C}_6\text{H}_3 \\ \text{R} \end{array}\right]_y-\text{Cl}$;

R = -H or -COOH. The content of azo groups increases with increasing length of the chain. The carboxyl group in ortho-position favors the elimination of nitrogen. Fig. 2 shows that the loss in weight on heating (up to 450°C) attains rapidly a limit for every temperature. The infrared spectra taken with an MKC-11/4 (KS-11) spectrometer proved the mere para-substitution in the aromatic ring as well as a probably quinoidal structure of the ring and rod form of the molecules. The latter fact explains the anomalous viscosity. The spectrum of electron paramagnetic resonance taken with D. G. Semenov's radiospectrometer (cf. Ref. 11) indicates unpaired electrons whose concentration is of the order of 10^{18} - 10^{19} and confirms the radical character of the reactions. The shortness of the polymer chains obtained is explained by the formation of stable biradicals which, due to the delocalization of unpaired electrons, have only a low reactivity. The formation of such biradicals was proved by reacting polymers with p-diethynylbenzene at high temperatures. Unmeltable and insoluble products were formed. The magnetic properties and the electrical conductivity of

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Production and Properties of Some Aromatic
Polymers

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the polymers will be described later. The authors thank I. A. Blyumenfel'd,
Yu. Sh. Moshkovskiy, and A. A. Slinkin for studying the spectra and
magnetic properties. There are 2 figures, 2 tables, and 19 references:
8 Soviet, 8 US, 2 German, and 1 Dutch.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR
(Institute of Chemical Physics of the AS USSR)

SUBMITTED: January 18, 1960

Card 3/3

S/190/60/002/006/001/012
B015/B064

AUTHORS: Berlin, A. A., Uzina, R. V., Shmurak, I. L.
TITLE: ~~On Some Factors Influencing the Adhesion of Rubber~~ on the
Tissue Fiber, Steeped With Latex Albumin Mixtures
PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 6,
pp. 832-837
TEXT: The adhesive power between rubber and tissue is of special
importance in the production of tissue-reinforced rubber products such as
car tires, bands, assembly lines etc. To increase the adhesive power, the
cotton- or man-made fiber tissue is steeped with albumin containing latex
mixtures in the USSR. A method of producing a water-soluble modification
of keratin (keratein) from industrial waste products was developed
(Ref. 6) in the laboratoriya vysokomolekulyarnykh soyedineniy MTIMMP
(Laboratory of Highmolecular Compounds MTIMMP). The waste products are
treated with strong reduction-, or oxidizing agents, with the -S-S-
cystine bond of the keratin macromolecules being torn; thus, the water-
soluble keratein forms. Investigations carried out by the authors (Ref. 7)
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On Some Factors Influencing the Adhesion
of Rubber on the Tissue Fiber, Steeped With
Latex Albumin Mixtures

S/19760/002/006/001/012
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showed already that keratin is a complete substitute for casein that has hitherto been used for the above-mentioned steep solutions. The present paper mentions some of the results obtained on the behavior of keratin and other latex albumin mixtures used for tissue steeping. The adhesive power of rubber on steeped tissue may be assumed to depend on the content of amino acids with polar side chains in the albumin molecule. In this respect, keratin does not very much differ from casein and albumin (Table 1, values of adhesive power between CKE-(SKB-), CKC-ZOAM (SKS-ZOAM-), and HK-(natural-) rubber and tissue steeped with casein, keratin and albumin containing mixtures respectively). Since albumins represent polymeric electrolytes, their properties are influenced by the pH. Experiments showed that an increase of the pH of the steeping mixtures reduces the adhesive power of rubber on steeped tissue. The increase in the ionization of the albumin molecules taking place in alkaline solutions was assumed to bring about a directioning of the molecule chain and formation of a net structure. These assumptions were confirmed by determining the value b/a (Table 2) (b = longer axis of the extended molecules, a = short axis), as well as by measurements of the flow time (in dependence

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On Some Factors Influencing the Adhesion
of Rubber on the Tissue Fiber, Steeped With
Latex Albumin Mixtures

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on pressure) on casein- and keratin solutions through a capillary. The
"longer" the albumin molecule is the longer will the flow time be. The
poor adhesive power of rubber on tissue steeped with solutions of a higher
pH is due to a deterioration of the mobility of the "extended" albumin
molecule. There are 4 figures, 2 tables, and 15 references: 9 Soviet,
4 US, 1 German, and 1 Austrian.

ASSOCIATION: Moskovskiy tekhnologicheskii institut myasnoy i molochnoy
promyshlennosti (Moscow Technological Institute of the Meat-
and Milk Industry). Nauchno-issledovatel'skiy institut
shinnoy promyshlennosti (Scientific Research Institute of
the Tire Industry)

SUBMITTED: January 23, 1960

Card 3/3

87011

15.8106

S/190/60/002/007/015/017
B020/B052

AUTHORS: Barkalov, I. M., Berlin, A. A., Gol'danskiy, V. I.,
Dzantiyev, B. G.

TITLE: Radiation Polymerization of Phenyl Acetylene

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 7,
pp. 1103-1107

TEXT: Purpose of this paper was the investigation of kinetics and the mechanism of the radiation polymerization of phenyl acetylene which was initiated by electrons with an energy of 1.5 Mev. The irradiation was carried out in special cuvettes (Fig. 1 a). The electron beam was introduced through a plane-parallel glass window 0.5 mm thick. For accurate thermostating within the range of positive temperatures, a different type of cuvette was used (Fig. 1, b). The temperatures of the polymerization were -196 to +85°C. The reaction yield was not higher than 10 - 12%, since in all experiments the initial stage of polymerization was investigated. The radiation dose was determined by a chemical dosimeter (0.02 mole/l of

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Radiation Polymerization of Phenyl
AcetyleneS/190/60/002/007/015/017
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CuSO_4 , 0.002 mole/l of FeSO_4 , and 0.02 n of H_2SO_4) which was recommended by the Institut im. L. Ya. Karpova (Institute imeni L. Ya. Karpov). The developing Fe^{3+} was photometrically examined by a CF-4 (SF-4) spectrophotometer. The IR spectra of polyphenyl acetylene were studied by Yu. Sh. Moshkovskiy. The polyphenyl acetylene yield rises proportionally to the dose of wide ranges (10^7 - 10^8 roentgen) (Fig. 2). Even with the largest doses applied, no noticeable destruction of the developed polymer was observed. This seems to prove the absence of effective inhibitor additions whose presence would be indicated by the S-shape of the curve. In the presence of atmospheric oxygen, the polymer yield is increased to the 1.5- to 2-fold under otherwise equal conditions. With a certain dose, the polymer yield does not depend on its quantity, not even at temperatures near the melting point or when the liquid monomer is exposed to radiation. The dependence of the polymer yield on the quantity of the dose was also investigated (Fig. 2) at 0 and -78°C . The extremely low dependence of the polymerization rate of phenyl acetylene on the temperature is also typical. Experiments were carried out regarding the polymerization of phenyl acetylene in nonane and ethyl acetate. In these two solvents the

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Radiation Polymerization of Phenyl
AcetyleneS/190/60/002/007/015/017
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polymer yield differed widely from that expected on the basis of the additivity law (Fig. 3). A very effective radiation energy transfer (the radiation is absorbed by the solvent molecules) to the phenyl acetylene molecules is observed. Substances with structures of the polyacetylene type have the same properties as aromatic hydrocarbons, namely that of taking up the energy of ionizing radiation. The laws of phenyl acetylene polymerization in many respects are specific, sometimes even the opposite of those of the usual radical polymerization. Summing up one may say that the polyphenyl acetylene yield is approximately 8 - 9 molecules when the radiation is 100 ev. In the liquid phase, polymerization and initiation rates are proportional. The activation energy is as low as approximately 700 kcal/mole. A mechanism was suggested which explains the unusual results by the specific properties of highly conjugated products during the polymerization of phenyl acetylene. In these products a strong delocalization of unpaired elements takes place, and the reactivity of similar molecules is reduced with an increase in their length. There are 3 figures and 6 references: 4 Soviet and 2 US.

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Radiation Polymerization of Phenyl
Acetylene

87031

S/190/60/002/007/015/017
B020/B052

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of
Chemical Physics of the AS USSR)

SUBMITTED: March 26, 1960

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86293

S/190/60/002/008/004/017
B004/B054

11.2210 also 2209

AUTHORS: Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin,
V. A.

TITLE: Modification of Polyvinyl Chloride by Rubbers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 8,
pp. 1188-1192

TEXT: The authors attempted to make graft copolymers from vinyl chloride and rubbers. In contrast to the unsuccessful copolymerization with the aid of latex reported on in Ref. 2, they used coarsely disperse rubber emulsions. Photogelatin, Sulfanole, or polyvinyl alcohol were used as emulsifiers. Copolymerization was conducted by two methods: 1) Swelling or dissolving of the rubber in vinyl chloride at 40-70°C, and subsequent polymerization in an autoclave after adding ammonium persulfate as initiator; 2) rolling of the rubber with ammonium-persulfate powder at room temperature, and subsequent copolymerization with vinyl chloride in an autoclave at 60-70°C. Viniplast was made from the reaction products by adding calcium stearate, lead monoxide, Neozone D, and transformer oil, kneading at 155-170°C, and pressing. The resulting products showed worse physical

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Modification of Polyvinyl Chloride by Rubbers S/190/60/002/008/004/017
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properties than pure polyvinyl chloride. On the other hand, a joint plastication of polyvinyl chloride (PVC) of the type ПФ-4 (PF-4) with HK (NK) natural rubber, CK5 (SKB) butadiene rubber, CKH (SKI) isoprene rubber, CKH-26 (SKN-26) butadiene-nitrile rubber, and chloroprene rubber (nairit), led to the following results:

PVC combined with:	Content of rubber, %	toughness kg·cm/cm ²	tensile strength kg/cm ²	relative elongation, %
(without rubber)	0	8.6	550	82
natural rubber	10	9.7	354	4.4
butadiene rubber	10	6.7	350	5.8
isoprene rubber	10	3.7	357	9.7
nairit	10	16.5	437	81.5
butadiene-nitrile rubber	10	34.6	551	100

Rubbers with marked polarity (nairit, SKN-26) showed double to fourfold toughness. Hydrogen bonds are likely to form between the polar rubber and PVC. There are 2 figures, 2 tables, and 7 references: 1 Soviet, 4 US, 1 Belgian, and 1 French.

SUBMITTED: March 21, 1960
Card 2/2

BERLIN, A.A.; STUPEN', L.V.; PEDOSKEYEV, B.I.; YANOVSKIY, D.M.

Graft copolymerization. Part 6: Fractionation of the products
from the graft polymerization of vinyl chloride with the
butyl methacrylate-methacrylic acid copolymer. Vysokom.
soed. 2 no.8:1227-1233 Ag '60. (MIRA 13:9)
(Ethylene) (Methacrylic acid)

83482

5.3830A also 2109, 2209

S/190/60/002/009/017/019
B004/B060

AUTHORS: Berlin, A. A., Dubinskaya, A. M.

TITLE: Studies in the Field of the Mechanochemistry of Polymeric Substances. X. Initiation of Polymerization With Radicals Forming on the Destruction of Macromolecules by Means of Ultrasonics 71

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 9, pp. 1426-1431

TEXT: In contrast to other papers (Refs. 1, 2, 5), the authors studied the ultrasonic destruction and the formation of copolymers in anhydrous medium, solutions of polymethyl methacrylate (PMMA) in acrylonitrile, methyl methacrylate, and styrene. The molecular weight of PMMA (viscosimetrically determined in benzene) was 3,160,000. The solution of the polymer in the monomer was exposed in argon atmosphere to ultrasonic radiation of 1500 kc/sec and a calorically measured intensity of 5 - 50 w/cm². The apparatus had been described earlier (Refs. 6, 8). Since the temperature

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Studies in the Field of the Mechanochemistry
of Polymeric Substances. X. Initiation of
Polymerization With Radicals Forming on the
Destruction of Macromolecules by Means of
Ultrasonics

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B004/B060

rose to 50°C, cooling spells were put in. The degree of polymerization was determined on the strength of changes in the refractive index of the solution, on the strength of increase in the polymer weight, and - in acrylonitrile - on the strength of the nitrogen content. For control, monomers alone were acoustically irradiated, and no polymerization occurred after 30 min either. Acoustical irradiation of 1-2% PMMA solutions in the monomers always gave rise to polymerization, the rate of which decreased in the order acrylonitrile - methyl methacrylate - styrene (Table 1). The reaction of PMMA with acrylonitrile was examined more closely. Table 2 gives the action of various ultrasonic intensities, Table 3 supplies the experimental results at 7 w/cm², 1.5 min irradiation, and a 3 min pause. A block copolymerization of PMMA with polyacrylonitrile (PAN) was established. The infrared spectrum of the copolymer with a ratio PMMA/PAN = 30/70 exhibited both bands of the nitrile group and of

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83482

Studies in the Field of the Mechanochemistry
of Polymeric Substances. X. Initiation of
Polymerization With Radicals Forming on the
Destruction of Macromolecules by Means of
Ultrasonics

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B004/B060

the ester group. The viscosity and the Huggins constant were also determined (Table 4). The thermomechanical curve (Fig. 4) for PMMA/PAN = 47/53 and for a mixture of the polymer components in the same ratio shows that the copolymer has a branched, partly cross-linked structure. As in the polymerization by means of gamma rays, an after-polymerization occurred here as well, especially at higher temperatures. There are 1 figure, 4 tables, and 12 references: 4 Soviet, 2 US, 3 British, and 3 German.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR
(Institute of Chemical Physics of the AS USSR)

Card 3/4

Studies in the Field of the Mechanochemistry
of Polymeric Substances. X. Initiation of
Polymerization With Radicals Forming on the
Destruction of Macromolecules by Means of
Ultrasonics:

83482
S/190/60/002/009/017/019
B004/B060

SUBMITTED: April 22, 1960

Card 4/4

5.3830

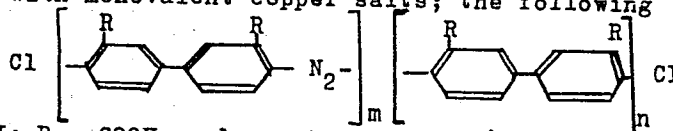
S/190/60/002/010/009/026
B004/B054

AUTHORS: Liogon'kiy, B. I., Lyubchenko, L. S., Berlin, A. A.,
Blyumenfel'd, L. A., and Parini, V. P.

TITLE: Polymers With Conjugate Bonds and Heteroatoms in the Con-
junction Chain. XI. The Spectra of Electron Paramagnetic
Resonance of Linear Aromatic Polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 10,
pp. 1494-1499

TEXT: In previous papers (Refs. 1, 2), the authors obtained aromatic
polymers by reaction of bis-diazotized benzidine, benzidine-3,3'-dicarb-
oxylic acid, and o-toluidine with monovalent copper salts; the following
structural formula is given:



(polymer I: R = H; polymer II: R = COOH; polymer III: R = CH₃). The
electron paramagnetic spectra (epr) were taken (Figs. 1-3) of these poly-
Card 1/2

Polymers With Conjugate Bonds and Heteroatoms in the Conjunction Chain. XI. The Spectra of Electron Paramagnetic Resonance of Linear Aromatic Polymers S/190/60/002/010/009/026 B004/B054

mers and the copolymer from I and p-diethynyl benzene, and the concentration of the nonpaired electrons was found to be $10^{18} - 10^{19}$ in 1 g of substance (Table) by comparison with the epr spectrum of diphenyl-picrylhydracyl as a standard. All epr spectra showed a signal with g-factor 2.00 which remains unchanged on heating to $300-350^{\circ}\text{C}$ and cooling to 77°K , and is interpreted as a signal of the conjugate bonds. The broader epr signal, which is superposed to this signal in unheated samples, could not be analyzed because of the superposition, and is interpreted as a signal of less active, free radicals with localized free valency. The signal appearing additionally in the insoluble fraction with g-factor 2.05, which disappears on dissolution, is ascribed to low-molecular particles. The stability of the epr spectrum in the wide temperature range indicates the paramagnetic character of at least part of the polymer. There are 3 figures, 1 table, and 9 references: 8 Soviet and 1 US.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics of the AS USSR)

SUBMITTED: April 25, 1960

Card 2/2

86327

S/190/60/002/012/014/019
B017/B078

15.8102

2209

AUTHORS: Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin, V.A.

TITLE: New Method of Obtaining Graft Copolymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 12,
pp. 1839 - 1844

TEXT: A new method of obtaining graft copolymers by interaction between the polymers is suggested by the authors. This method permits to modify halogen-containing polymers with polymers having nitrogen-containing heterocycles. A case in point for such a reaction is the modification of PVC with methylvinylpyridine rubber under the formation of graft copolymers which are salts of quaternary polymer bases. Vinyl plastics obtained from such polymers have an impact strength ten times as high as that prepared solely from polyvinylchloride. Fig.1 illustrates the temperature dependence of some thermomechanical properties of some polyvinyl plastics. The two-stage formation of trimers is explained. Fig.2 illustrates the influence of the rubber content on the properties of polyvinyl plastics. X

Card 1/2

New Method of Obtaining Graft Copolymers

86327

S/190/60/002/012/014/019
B017/B078

Fig.3 shows the vitrification temperature of polyvinyl plastics as a function of the admixtures. It is demonstrated that the thermal stability of polyvinyl plastics is not impaired by a methylvinylpyridine rubber content up to 25%. The method suggested here may be applied to vulcanize various halogen-containing polymers with methylvinylpyridine rubber. There are 3 figures and 13 references: 9 Soviet and 4 US. ✓

SUBMITTED: May 24, 1960

Card 2/2

5:3700(A)(C)

AUTHORS: Berlin, A.A., Matveyeva, N.G.

69009

S/074/60/029/03/001/004
B008/B006

TITLE: Polymeric Chelate Compounds 1

PERIODICAL: Uspekhi khimii, 1960, Vol 29, Nr 3, pp 277-297 (USSR)

ABSTRACT: The authors describe new ways of preparing polymeric materials with properties required for technical development. One of these is the synthesis of chelate compounds. Chelates are known to be resistant to acids and bases and to agents which react with free metals (Ref 1). Many chelates are extremely stable at comparatively high temperatures (400° and higher). Groups which are able to form chelate rings ought to be termed chelating groups. Provided they are suitably arranged in the molecule, electron donor groups contained in chelating groups can form chelate rings in the presence of electrophilic ions or atoms. The stability of these chelate rings is much increased if these donor groups are in conjugation to each other. Examples are given on p 278. The resistance of these chelate rings to chemical agents and heat is determined by a number of factors: the structure and chemical nature of the chelating group, the ring tension, the number of rings connected with the corresponding ion, the electron structure of the complexing ion. In most cases, chelates are highly resistant to chemical agents (Refs 2 - 12). Basing on the funda-

Card 1/3

Polymeric Chelate Compounds

69009

S/074/60/029/03/001/004
B008/B006

mentals of synthetic polymer chemistry and the theory of complex compounds, the following four methods can be suggested for the preparation of polymeric chelate compounds (polychelates): 1) the polymerization of monomers containing a metal atom bound in the chelate ring; a) formation of linear or slightly branched macromolecules, b) formation of three-dimensional or highly branched macromolecules; 2) synthesis of polymers by polycondensation of substances with chemically stable chelate rings. Polymers are prepared by interaction of low molecular substances containing chelate rings and at least two reactive functional groups; 3) synthesis of polymers by interaction of polymers with either pure carbon chains or heterogeneous chains containing chelating groups with metal ions or metal atoms. This can lead to soluble (linear, branched) or insoluble (cross-linked) polymers; 4) polymer synthesis based on complex-forming low molecular substances with metal ions or metal atoms (Ref 13). Publications on the preparation of various chelate compounds are discussed (Refs 14-60) (Tables 1,2). It is evident from these examples that various types of polymers capable of forming complexes with metal ions can be prepared by proper choice of the method of synthesis. Thus, a great number of cross-linked polychelates can be prepared, which are of practical use as adsorbents for ions. ✓

Card 2/3

69009

Polymeric Chelate Compounds

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B008/B006

The polycoordination of low molecular compounds with chelating groups seems to be particularly promising. By applying these reactions it is possible to prepare both organic and inorganic polymeric compounds (Refs 61-79). The preparation of polymeric phthalocyanines is of great theoretical and practical interest (Refs 80-81). The authors recently discovered (Ref 82) a new type of polymeric chelate compound chiefly composed of carbon, nitrogen, and metals. Furthermore, the authors obtained polymeric chelates (Ref 83) from polyaminoquinones which had been synthesized for the first time. Data available so far do not give a complete picture of the mechanism of formation nor of the physico-mechanical properties of chelate compounds. Their special structure, however, and the countless preparation methods open up unexpected possibilities of preparing substances with properties intermediate between those of metals and metalloids. The following persons are mentioned: the authors, V.A. Klyachko, S. Tanator, Ye. Kurovskiy, and A.I. Sherle. There are 2 tables and 83 references, 6 of which are Soviet.

ASSOCIATION: Laboratoriya anizotropnykh struktur AN SSSR (Laboratory of Anisotropic Structures of the AS USSR)

Card 3/3

4

S/074/60/029/010/001/004
B013/B075

AUTHOR: Berlin, A. A.

TITLE: Basic Trends of Research in the Field of Chemical Conversions of Macromolecules

PERIODICAL: Uspekhi khimii, 1960, Vol. 29, No. 10, pp. 1189-1228

TEXT: The present survey deals with the research in the field of chemical conversions of macromolecules. Research work on structures and chemical conversions of macromolecules under the action of various chemical, physical, and mechanical factors, is first of all necessary to meet the requirements of the industry interested in a controlled modification of polymer properties. Work carried out in this field during the past 10-15 years brought about new synthesis methods by means of which composition, structure, and properties of macromolecules can be influenced. According to the experimental material available, the author divides most of the reacting polymeric substances into 4 principal groups. He suggests the following classification: 1) Intramolecular conversions of macromolecules. Hereto belong dehydrogenation, dehydrochlorination, dehydration, and other

Card 1/5

Basic Trends of Research in the Field of Chemical
Conversions of Macromolecules

S/074/60/029/010/001/004
B013/B075

separation processes (Refs. 2-14) as well as intramolecular cyclization (Refs. 15-19). Due to such conversions, the structure and the configuration of the principal chain vary; the degree of polymerization, however, is not varied considerably. 2) Reactions of atoms, functional groups, and active centers of macromolecules, which are not followed by a growth of polymer chains. This group is to comprise those chemical conversions of macromolecules, which concern reactive atoms and functional groups of the principal chain reacting with low-molecular substances. The present survey mentions only those methods which have been developed during the past 8-10 years or have grown important. These are the following: Substitution (Refs. 20-23); reactions of functional groups (Refs. 24-35); addition to double bonds (Refs. 15, 36-41). 3) Growth of polymer chains during the interaction between the end groups of macromolecules (block polymerization). Hereto belong interactions between end groups or active centers of polymeric macromolecules and monomeric or polymeric substances, which lead to the formation of high-polymer chains. These chains consist of sections, i.e., blocks having a specific size, composition, and structure. The author notes that a distinction between block-copolymerization and co-condensation would be more correct, and that a considerably greater number of reactions would belong to them, than has hitherto been known. For the
Card 2/5

Basic Trends of Research in the Field of
Chemical Conversions of Macromolecules

S/074/60/029/010/001/004
B013/B075

representation of block-copolymers with a linear structure, mechano-chemical (Refs. 42-62) and chemical methods (Refs. 18, 43, 65) were employed. For the mechano-chemical block-copolymerization, the mechanism of which is not completely investigated, the author suggests the following scheme: 1) Formation of active chains: $R^{\cdot}R + m^{\cdot}m \rightarrow R^{\cdot} + m^{\cdot}$; 2) Formation of the chain: $R^{\cdot} + m-m \rightarrow Rm + m^{\cdot}$, etc. $m^{\cdot} + R-R \rightarrow Rm + R^{\cdot}$; 3) Rupture of the chain: a) due to recombination: $R^{\cdot} + m^{\cdot} \rightarrow Rm$; $m^{\cdot} + m^{\cdot} \rightarrow m-m$; $R^{\cdot} + R^{\cdot} \rightarrow R-R$; b) due to disproportionation: $R^{\cdot} + R^{\cdot} \rightarrow 2R^{\cdot}$; $R^{\cdot} + m^{\cdot} \rightarrow R_1 + m^{\cdot}$; c) due to the reaction with the medium, with container walls or with admixtures: $R^{\cdot} + AX \rightarrow RX + A$; $A^{\cdot} + A^{\cdot} \rightarrow A-A$. For the synthesis of block-copolymers with a steric structure, the author suggests the following types: Type 1 - polymerization or copolymerization of branched blocks with more than two active end centers or reactive end groups (Refs. 46-68); type 2 - reaction of linear (or branched) blocks with low-molecular blocks containing at least two reactive groups; type 3 - polymerization of blocks with difunctional groups on the chain ends. These blocks possess the capability of a chain- or stepwise polymerization (Refs. 73-77). 4) Reactions of intramolecular groups with active centers of macromolecules accompanied by the growth of the polymer chain. In this process branched or three-dimensional high-molecular compounds form, which

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Basic Trends of Research in the Field of
Chemical Conversions of Macromolecules

S/074/60/029/010/001/004
B013/B075

are known as graft copolymers. Also reactions of cross linking belong here. The following reactions are described: 1) graft polymerization (Refs. 43, 65, 78, 79); 2) synthesis of graft copolymers by means of "chain transmission" (Refs. 80-91). For that most easily realizable method of modifying the properties of polymers, the author suggests the following scheme: 1. Formation of active centers: a) with the decomposition of the initiator $RR \rightarrow R^\bullet + R^\bullet$; b) with the interaction of R^\bullet with macromolecules R_nH : $R^\bullet + R_nH \rightarrow RH + R_n^\bullet$. 2. Growth of the chain: a) with the homopolymerization of the monomer $R^\bullet + M \rightarrow R-M$; b) with the graft copolymerization: $R_n^\bullet + M \rightarrow R_n-M-M-M^\bullet$. 3. Rupture of the chain: A) by means of recombination: a) of growing homopolymerize chains: $2R-M-M-M-M^\bullet \rightarrow (R-M-M-M-M)_2$; b) of different macroradicals: $R-M-M-M-M^\bullet + R_n^\bullet \rightarrow R-M-M-M-R_n$ (branched graft copolymers); $2R_n-M-M-M-M^\bullet \rightarrow (R_n-M-M-M-M)_2$; $2R_n^\bullet \rightarrow (R_n)_2$ (three-dimensional graft copolymers). B) By means of disproportionation: $R_n(M)_n^\bullet + R_n(M)_n^\bullet \rightarrow R_n(M)_n + R_n(M)_m$. 3) Graft copolymerization of polymers with active centers in

Card 4/5

Basic Trends of Research in the Field of
Chemical Conversions of Macromolecules

S/074/60/029/010/001/004
B013/B075

macromolecules (Refs. 92-101); 4) Graft copolymerization of unsaturated polymers. Three-dimensional graft copolymers (Refs. 76, 102-107); synthesis of graft copolymers by means of polycondensation and stepwise polymerization (Refs. 1, 43, 108-112); reactions of cross linking (Refs. 1, 23, 26, 113-124). The author notes that the classification suggested by him has the character of a mere chance, since numerous chemical conversions of polymers proceed according to a complicated mechanism, which, however, includes processes of various types in its individual stages. There are 2 figures and 124 references: 71 Soviet, 32 US, 12 British, 2 Belgian, 1 Canadian, 1 Dutch, 5 French, 14 German, 1 Italian, and 2 Japanese.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR
(Institute of Chemical Physics AS USSR)

Card 5/5

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80103

S/080/60/033/04/21/045

AUTHORS: Berlin, A.A., Popova, Z.V., Yanovskiy, D.M.TITLE: The Stabilization of Polyvinylchloride by Tin-Organic Compounds.
Communication 4.

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, Nr 4, pp 871 - 877

TEXT: The following products were studied as stabilizers and inhibitors of the thermal destruction of polyvinylchloride (PVC),¹⁵ the condensation products of dibutyl-tin with butyl, amyl and octyl alcohols and tin-organic compounds of the general formula $(C_4H_9)_2SnX_2$, where X is an acyl radical containing or not containing sulfide or epoxide groups. The stabilizing effect was tested on PVC of the "PF-Special" type. It has been shown that in the presence of the substances mentioned the decomposition temperature of PVC increases, as well as the duration of the induction period. The rate of hydrogen chloride liberation decreases during heating of the polymer. Tin-organic stabilizers are inhibitors of PVC decomposition. The inhibiting action is most clearly evident in dibutyl-tin dioctylmercaptide. The stabilizing action of tin-organic compounds practically does not depend on the number of carbon atoms in the alkoxy- and acid groups. The efficiency of the action is considerably intensified if an oxygen atom

Card 1/2

80103

S/080/60/033/04/21/045

The Stabilization of Polyvinylchloride by Tin-Organic Compounds. Communication 4.

in the alkoxy-group is substituted by a sulfur atom. This can be explained by the combination of the properties of antioxidant and dehydrochlorination inhibitor in the sulfur-containing tin-organic compounds. The behavior of tin-organic compounds as acceptors of hydrogen chloride differs sharply from the behavior of typical accepting stabilizers. In the case of heating PVC in the presence of tin-organic compounds, the concentration of ionic chlorine present in the polymer decreases due to the binding of hydrogen chloride by the stabilizer. The application of tin-organic compounds in a mixture with antioxidants, as well as the application of ternary mixtures containing a tin-organic stabilizer, an antioxidant and a typical acceptor of hydrogen chloride, leads to a considerable intensification of the stabilizing action. N.A. Rybakova, N.K. Taykova and Ye.N. Zil'berman are mentioned as suppliers of the tin-organic materials. There are: 3 tables, 3 graphs and 12 references, 4 of which are Soviet, 5 American, 1 English, 1 German and 1 French.

ASSOCIATION: Filial Nauchno-issledovatel'skogo instituta Goskomiteta po khimii (Branch of the Scientific Research Institute of the State Committee for Chemistry)

SUBMITTED: August 4, 1959

Card 2/2

84831

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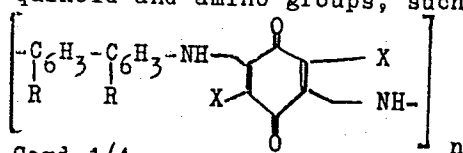
S/020/60/134/005/019/023
B004/B064

AUTHORS: Balabanov, Ye. I., Berlin, A. A., Parini, V. P.,
Tal'roze, V. L., Frankevich, Ye. L., and Cherkashin, M. I.

TITLE: Electrical Conductivity of Polymers With Conjugated Bonds

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 5,
pp. 1123-1126

TEXT: To investigate the electrical conductivity σ and its temperature dependence, the authors synthesized the following polymers: 1) Polymers with a noncyclic conjugated chain, such as polyphenyl acetylene, and its copolymers with hexine or paradiethinyl benzene; 2) polymers with benzene rings in the conjugation chain, such as polyphenylene, polyphenylene diazo compounds, polymeric-aromatic and aliphatic-aromatic compounds with quinoid and amino groups, such as



(X = H, Cl at R = H; X = H at R = COOH);

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Electrical Conductivity of Polymers With
Conjugated Bonds

S/020/60/134/005/019/023
B004/B064

poly-p-phenylenediamino quinone, polyhexamethylene diamino quinone;
polyphenylene azoquinone; a polymeric triazene $[-C_6H_4-C_6H_4-NH-N=N-]_n$
and a substance (16) with a quinoimine group $[-C_6H_4-N=C_6H_4=N-]_n$; polymeric
chelate compounds of polydiphenyl aminoquinone with metals (e.g. Cu);
molecular complexes of acenaphthene with chloranil, and with a pyridonium
derivative of polyphenylene aminoquinone; 3) chelate compounds, such as tetra-
salicyl ferrocene and its polymeric chelate complexes with Fe^{2+} (21) and Be^{2+} (22); polymeric chelate complexes of percyanoethylene
with Cu^{2+} and Fe^{2+} . In all compounds, σ rose with temperature according
to the equation $\sigma = \sigma_0 \exp(-E/kT)$. σ_0 and E are constants characteristic
of each compound (Table 1). E varied from 4.6 kcal/mole (substance 16)
to 49.5 kcal/mole for polyphenyl acetylene, and reached 92 kcal/mole in
the complex compound of acenaphthene with chloranil. The treatment of the
sample influences σ_0 and E. If the polyphenyl acetylene film obtained from
the solution is pressed into tablets at 200°C, σ_0 decreases by 22 orders

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Electrical Conductivity of Polymers With
Conjugated Bonds

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B004/B064

of magnitude. Since, however, E decreases at the same time, σ remains almost constant. (σ_0 ranged from $10^{-12} \text{ ohm}^{-1} \cdot \text{cm}^{-1}$ in polyphenylene to $6 \cdot 10^{51} \text{ ohm}^{-1} \cdot \text{cm}^{-1}$ in the complex of acenaphthene with chloranil.) This compensation effect was observed in nearly all substances, as may be seen from the function $\log \sigma_0 = f(E)$ (Fig. 1). A change of σ_0 by 60 orders of magnitude and of E by 20 times was observed in substances of different structures. In the substances (16), (21), (22), σ was close to the electrical conductivity of organic semiconductors. In the case of polyphenyl acetylene, which is an insulator at room temperature, σ rises with rising temperature so much that, in consequence of its high σ_0 , the conductivity of many polymers is reached that are conductive already at room temperature. There are 1 figure, 1 table, and 17 references: 14 Soviet, 2 US, and 1 German.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR
(Institute of Chemical Physics of the Academy of Sciences
USSR)

Card 3/4

84831

Electrical Conductivity of Polymers With
Conjugated Bonds

S/020/60/134/005/019/023
B004/B064

PRESENTED: June 14, 1960, by V. N. Kondrat'yev, Academician

SUBMITTED: June 11, 1960

X

Card 4/4

20552

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S/019/61/000/005/047/078
A153/A127

AUTHORS: Berlin, A.A., Cherkashin, M.I., Sel'skaya, O.G., Limanov, V.Ye.

TITLE: A method of obtaining high-molecular products

PERIODICAL: Byulleten' izobreteniy, no. 5, 1961, 56

TEXT: Class 39c, 25⁰⁶. No. 136552 (631810/23 of June 22, 1959).
A method of obtaining high-molecular products, distinguished by the fact
that, in order to make the products infusible, insoluble and heat-resistant,
as well as to enable them to be used to prepare pressing compositions, poly-
vinylenes are subjected to reaction with monomers containing no less than
two ethinyl groups, e.g. with n-diethinylbenzene. X

Card 1/1

158102

2209

23234
S/019/61/000/009/036/069
A154/A128

AUTHORS: Kargin, V.A., Kronman, A.G., Yanovskiy, D.M., and Berlin, A.A.

TITLE: A method of obtaining graft polymers

PERIODICAL: Byulleten' izobreteniy, no. 9, 1961, 45

TEXT: Class 39c, 2501. No. 138044 (672813/23 of July 11, 1960).

1. A method of obtaining graft polymers on a base of vinyl chloride in the presence of initiators, distinguished by the fact that, in order to obtain polymers with good physico-mechanical properties, the copolymerization is carried out by dissolving nitrile rubber in vinyl chloride at 35-80°C. 2. A method as in 1., distinguished by the fact that the nitrile rubber is first subjected to mastication with a nitrator in a cold state and then dissolved in vinyl chloride. X

Card 1/1

15.8000 2209.2409

32170

S/019/61/000/021/037/074

A154/A126

AUTHORS: Berlin, A. A., Liogon'kiy, B. I., Parini, V. F.

TITLE: A method for producing polymers

PERIODICAL: Byulleten' izobreteniy, no. 21, 1961, 50

TEXT: Class 39b, 30. No. 142426 (723117/23 of March 24, 1961). A method for producing polymers possessing thermal stability up to 325°C and electrical conductivity, distinguished by the fact that, in order to give the polymers the property of rapid change of electrical conductivity with variations in temperature, radicals (gruppировки) like, e.g. CH₂ or NH, are introduced into the molecules of linear aromatic polymers with conjugate bonds, destroying the continuity of the bonds.

Card 1/1

BERLIN, A. A.

The International Symposium...

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3101/2215

methods of determining stereo-characteristics of macromolecules. V. A. Kargin, V. A. Kabanov (USSR): on the polymerization of insoluble, molecularly disperse substances. A. D. Abkin, A. P. Sheynker, M. K. Yakovleva, L. P. Meshirova, (USSR) on radiation polymerization in liquid phase. The Third Session dealt with problems of chemical transformations in polymer chains. T. Rakel, Z. Kozmider (Poland) reported on the chlorination of phenol-formaldehyde resins by sulfuric chloride. A. Ya. Yakubovich, T. Ya. Gordon, L. I. Maslennikova, Ye. M. Grobman, K. I. Trut'yakova, M. I. Kokoreva (USSR): on the transformation of polycarbonates. G. A. Kudryavtsev, Ye. A. Vasil'yeva-Sokolova, I. S. Masel' (USSR): on the interaction of poly- α -chloro-methyl methacrylate by amines. Z. Volkober, T. Holly, G. Turso (Hungary): on the interaction of substituted aromatic amines by polyvinyl chloride. I. M. Fingaus, A. V. Vorob'yeva, G. A. Shirokova, M. P. Dokuchayeva (USSR): sulfuration of the polymer during alcoholysis of polyvinyl acetate. B. A. Dogadkin, M. S. Fel'dshteyn, E. M. Mel'yayeva (USSR) reported on vulcanization accelerators. A. A. Berlin (USSR) gave a survey on the polymers with conjugate bonds. A. A. Berlin, V. I. Liagon'kiy, V. P. Farini (USSR) reported on polyconjugate polymers on the basis of aromatic bisdiazonines. M. A. Geyderikh, Card 7/10

14th SYMPOSIUM ON MACROMOLECULAR CHEMISTRY, held in Moscow on the suggestion of the USSR and decision of the IUPAC (International Union of Pure and Applied Chemists) 14-18 June 1960; Trakhsenbergshteyn'skiy Zhurnal Khimii, Vol 3, No 3, 1961, 1961, pp124-28, Engl

berlin, a. a.

The International Symposium...

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B101/B215

benzene rings in the radiolysis of polystyrene. Discussion sessions concentrated on: 1) interface polycondensation; 2) heat resistance of polymers, polymers with magnetic properties; 3) mechanism of ionic polymerization; 4) mechanism of stereospecific polymerization; 5) problem of emulsion polymerization; 6) chemistry of cellulose; 7) grafted copolymers; 8) polymerization of monomers in solid state. The following Soviet-bloc scientists participated in these discussions: A. A. ~~Barilina~~, V. L. Tal'rose, V. P. Parina, L. A. Blyumenfel'd, S. S. ~~Mogilov~~ (USSR), Z. Zlamal (CSR), A. R. Gantmakher (USSR), K. Vesely (CSR), A. I. Shatenshteyn, M. I. Novikovskiy, K. S. Minaker, V. K. Bikhovskiy, P. M. Khomikovskiy, M. F. Margaritova, O. D. Bereshnaya, Z. A. Kogovin, K. A. Plats, G. S. Kolesnikov, M. S. Akutin, P. V. Kozlov, N. M. Semenov, K. I. Adirovich, V. A. Kabanov, S. S. Urasovskiy, V. V. ~~Jayarodekiy~~, M. D. Sokolov, S. Z. Roginskiy, M. V. Vol'kenshteyn, Ye. V. Kuvshinskiy, V. I. Gol'danskiy (USSR). It is mentioned that the delegates were satisfied with the results of the symposium, and the level of the Soviet reports was by no means lower, in some specialized fields even higher than those of foreign scientists.

Card 10/10

11th SYMPOSIUM ON MACROMOLECULAR CHEMISTRY, held in Moscow on the suggestion of the USSR and decision of the IUPAC (International Union of Pure and Applied Chemists) 14-18 June 1960; *Vysokomolekululyarnaya Khimiya*, Vol 3, No 3, 1961, 1961, pp. 221-28, Engl.

BERLIN, A. A.

The International Symposium...

3/190/61/003/002/012/012
B101/B215

B. E. Davydov, B. A. Krentsel', I. M. Kustanovich, L. S. Polak, A. V. Topchiyev, R. M. Vaytenko (USSR): on semiconductor polymers. J. Mikeš, L. Kovacs (Hungary): on bipolar ion exchange resins. K. M. Saldadze (USSR) reported on the same subject; Ye. B. Trostyanetskaya, I. P. Losev, A. S. Tevlina, S. B. Makarova, O. Z. Nefedova, Lu Nelson-lao (USSR) on the chloromethylation of copolymers of styrene and divinyl benzene. Kh. U. Usmanov, V. M. Musayev, R. S. Tillayev (USSR): on radiation grafting of acrylonitril on polystyrene and polyperchloro-vinyl. I. Szanto, K. Gal (Hungary), Kh. U. Usmanov, B. I. Akhmedzhayev, U. Aizov (USSR) also reported on radiation grafting (acrylonitril on cellulose). M. Lászár, R. Rado, J. Pavlinec (CSR), O. S. Kolesnikov, Tseng Han-ming (USSR): on grafting by initiators. I. A. Tutorakiy, Z. I. Seely, V. M. Byetov (USSR): on copolymers of butadiene styrene rubber with ϵ -caprolactam. A. A. Berlin, Ye. A. Penskaya, O. I. Volkova (USSR): on the formation of styrene macroradicals in freezing and melting of aqueous solutions. V. A. Kargin, N. A. Plate (USSR) reported on initiating vinyl polymerization by disperse inorganic substances; R. Rado, M. Lászár (CSR): polymerization of polyethylene by peroxides. I. Mladenov, I. A. Tutorakiy, B. A. Dogadkin (USSR): action of γ -rays on butadiene styrene rubber.

Card 8/10

14th SYMPOSIUM ON MACROMOLECULAR CHEMISTRY, held in Moscow on the suggestion of the USSR and decision of the IUPAC (International Union of Pure and Applied Chemists) 14-18 June 1960; *Vysokomolekulyarnyye Soedineniya*, Vol 3, No 3, 1961, pp324-36, (Engl)

15.7140

89857

S/019/61/000/002/042/111
A156/A027

AUTHORS: Belyayeva, K.P., Berlin, A.A., Kefeli, T.Ya., Nagorskaya, T.A., and
Raskin, Ya.L.

TITLE: A Method of Obtaining a Polyetheracrylic Varnish

PERIODICAL: Byulleten' izobreteniy, 1961, No. 2, p. 39

TEXT: Class 39b, 4⁰². No. 135216 (663279/23 of April 15, 1960). This method is used in the presence of solvents and initiators. In order to make a coat from this varnish capable of drying outdoors without being heated, polyetheracrylate is blended with a mixture of nitrocellulose, styrene and acetone.

Card 1/1

11 BERLIN, A. A.

(P)

USSR

SECRET, ACTIVITY CONTINUED, (WILL BE COPIED), (1962)
(elected 1 April 1962)

[illegible]

From Sovetskaya Kul'tura, 2 Apr 62, 1961.

S/661/61/000/006/047/081
D244/D302

AUTHOR: Baranovskaya, N. B., Berlin, A. A., Zakharova, M. Z. and
Mizikin, A. I.

TITLE: Vulcanization of polydimethyl siloxanes at room temperature

SOURCE: Khimiya i prakticheskoye primeneniye kremneorganicheskikh
soyedineniy; trudy konferentsii, no. 6: Doklady, diskus-
sii, resheniye. II Vses. konfer. po khimii i prakt. prim.
kremneorg. soyed., Len. 1958. Leningrad, Izd-vo AN SSSR,
1961, 208-210

TEXT: This is a discussion in which S. N. Borisov (VNIISK, Lenin-
grad), Z. N. Nudel'man (NIIRP, Moscow), I. K. Stavitskiy (VNIISK,
Leningrad) and K. A. Rzhendzinskaya (VNIISK, Leningrad) took part.
The authors disclosed that the cold vulcanizates preserve their
elasticity at 200°C for 200 hours. At 300 - 350°C their working pro-
perties deteriorate. This applies to the rubbers containing TiO_2

Card 1/2

Vulcanization of polydimethyl...

S/661/61/000/006/047/081
D244/D302

and ZnO. The scheme of vulcanization proposed by the authors agrees well with experimental data; in particular, it explains the influence of the structure of organic tin compounds on their catalytic action. In addition, the character of the vulcanization process, its development and the presence of induction period can be explained by postulating the formation of intermediate complex. The swelling property of the "cold" vulcanized polymer, investigated in toluene, was the same as that of the "hot" vulcanized rubber. The viability period of the mixtures decreases with the rate of vulcanization.

✓

Card 2/2

RASKIN, Ya.L.; ERMAN, V.Yu.; BELYAYEVA, K.P.; BERLIN, A.A.

Use of polyester acrylates as film-forming agents. Report No. 2:
Film-forming capacities of polyester acrylates. Lakokras.mat i
ikh prim. no.2:21-26 '61. (MIRA 14:4)
(Acrylic acid) (Films (Chemistry))

KOROLEV, G.V.; MAKHONINA, L.I.; BERLIN, A.A.

Polymerization in highly viscous systems and three-dimensional polymerization. Part 1: Kinetic characteristics of the polymerization of some polyacrylates. Vysokom. soed. 3 no. 2: 198-204 F '61. (MIRA 14:5)

1. Institut khimicheskoy fiziki AN SSSR.
(Acrylic acid) (Polymerization)

89989

S/190/61/003/003/004/014
B101/B204

18.8/12

AUTHORS:

Parini, V. P., Kazakova, Z. S., Okorokova, M. N.,
Berlin, A. A.

TITLE:

Polymers with a system of conjugate bonds and hetero-atoms
in the conjunction chain. XII. Synthesis and properties
of several polyaminoquinones

PERIODICAL:

Vysokomolekulyarnyye soyedineniya, v. 3, no. 3, 1961,
402-407

TEXT: A. A. Berlin and N. G. Matveyeva (Ref.1: Vysokomolek. soyed., 1,
1643, 1959) described the formation of polyaminochloroquinones by reac-
tions between diamines and chloranil. These compounds have a positive
magnetic susceptibility and the properties of electron exchangers. The
present paper describes a study of the formation of polyaminoquinones by
means of reactions between diamines and non-substituted quinones. The
reactions were made with p-phenylene diamine (reaction product I),
benzidine (II), benzidine-3-3'-dicarboxylic acid (III), and hexamethylene
diamine. The diamines dissolved in alcohol or the acid dissolved in

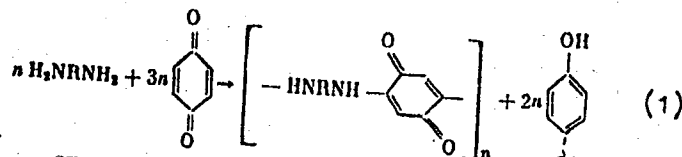
Card 1/6

Polymers with a system...

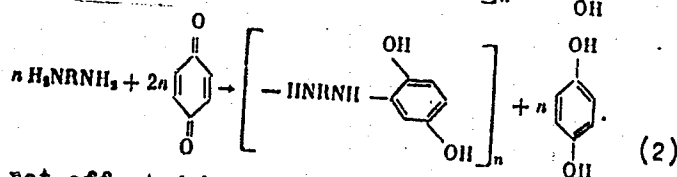
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B101/B204

aqueous-alcoholic solution of NaOH were added to boiling quinone. The resulting precipitate was filtered off after 24 hr, treated for several times with hot alcohol, 5% NaOH, and 5% HCl, and was finally rinsed with water, alcohol, and ether. On the basis of the polymer yield and of the quantities of hydroquinones that had formed, it was concluded that only the first of the two possible reactions



and



takes place, and that it is not affected by excess diamine. Therefore, further experiments were made with a ratio diamine/quinone = 1/3. On the

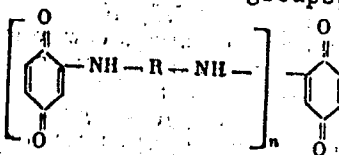
Card 2/6

Polymers with a system...

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basis of data from elementary analysis and of the chemical behavior of the polymers which indicates quinone terminal groups, the following formula is assumed:



where R = $(\text{CH}_2)_6$; C_6H_4 ; C_{12}H_8 ; $\text{C}_{12}\text{H}_6(\text{COOH})_2$. A degree of polymerization of 5 - 10, and thus a molecular weight of 1000 - 3000 followed from the ratio N/C. The substances I - III are dark brown powders. They form blue or violet solutions in concentrated H_2SO_4 and are partially soluble in quinoline, and only slightly soluble in other organic solvents. III gives a brown solution in dimethyl formamide and alkali. Hard films were obtained from this solution. III dissolved in dimethyl formamide forms a black precipitate with copper acetate which probably has a cross-linked chelate structure. Benzidine dicarboxylic acid dissolved in dimethyl formamide

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was caused to react with quinone in order to obtain polymers of higher molecular weight. The result were black substances. The reduced viscosity of III dissolved in dimethyl formamide showed an anomaly. (Fig. 1). The substances I - III have electron exchanger properties. They may be partially reduced and are oxidized again by atmospheric oxygen. The fact that they can be reduced only difficultly, and the epr spectrum observed lead to the conclusion that the conjunction of the bonds is not interrupted by the imino group between the benzene rings. These substances have a positive magnetic susceptibility, are highly refractory (loss in weight after 1 hr of heating at 350°C 10.5 - 11%, after one further hour at 450°C about 5%), and are not combustible. Their conductivity obeys the law for semiconductors: $\sigma = \sigma_0 \exp(-E/kT)$. The following was found:

Polymer	E, ev	σ_0 , ohm ⁻¹ .cm ⁻¹	σ_{200} , ohm ⁻¹ .cm ⁻¹
I	0.9	30	10 ⁻¹⁵
II	1.0	30	10 ⁻¹⁶
III	0.4	2.10 ⁻³	10 ⁻¹⁰

According to these data, III has semiconductor properties. The possibility of a partial semiquinone structure is discussed. The reaction product
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Polymers with a system...

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of quinone and hexamethylene diamine, a brown, elastic, easily combustible substance, was not examined in detail. There are 2 figures, 3 tables, and 10 references: 6 Soviet-bloc and 4 non-Soviet-bloc. The 3 references to English-language publications read as follows: H. G. Cassidy, J. Amer. Chem. Soc., 71, 402, 1949; H. G. Cassidy, J. H. Updergraff, ibid. 71, 407, 1949; D. Bijl, H. Kainer, A. C. Rose-Innes, Nature, 174, 830, 1954.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR
(Institute of Chemical Physics, AS USSR).
Vsesoyuznyy zaochnyy institut tekstil'noy i legkoy
promyshlennosti (All-Union Correspondence Institute of
Textile and Light Industry)

SUBMITTED: July 5, 1960

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Polymers with a system...

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B101/B204

Legend to Fig. 1:
a) g/100 ml

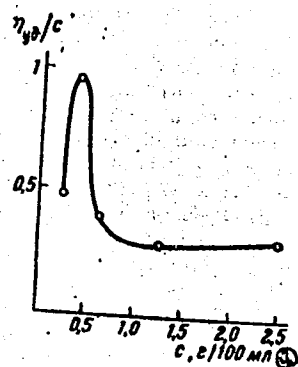


Рис. 1

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28178

S/190/61/003/010/007/019
B124/B110

11.2215 also 2209

AUTHORS: Berlin, A. A., Liogon'kiy, B. I., Parini, V. P.

TITLE: Aromatic polytriazenes

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 10, 1961,
1491 - 1494

TEXT: The present paper deals with the synthesis and study of aromatic polytriazenes of the composition - $\left[\text{---} \text{C}_6\text{H}_4 \text{---} \text{C}_6\text{H}_4 \text{---} \text{N} = \text{N} - \text{NH} \right]_n \text{---} \text{C}_6\text{H}_4 \text{---} \text{C}_6\text{H}_4 \text{---}$ the diazoamino group of which is between benzene rings and characterized by high proton mobility. The compounds studied were synthesized by reaction of bis-diazonium salts with diamines in the presence of sodium acetate: $n\text{ClN}_2 - \text{R} - \text{N}_2\text{Cl} + n\text{H}_2\text{N} - \text{R} - \text{NH}_2 \xrightarrow[\text{-HCl}]{\text{CH}_3\text{COONa}} \text{Cl} - \left[- \text{R} - \text{N} - \text{N} - \text{NH} - \right]_{2n-1} - \text{R} - \text{NH}_2$. A bis-diazonium salt solution was added dropwise under intensive mixing to the aqueous-alcoholic solution of benzidine and sodium acetate cooled down to 0°C, and the reaction was carried out in argon current. The yield was 92.5% referring to the fundamental unit of

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Aromatic polytriazenes

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B124/B110

polymer. The polymer is a brick-red powder partly soluble in aniline, acetone, benzene, dioxane, pyridine, acetic anhydride, and quinoline, and entirely soluble in dimethyl formamide, concentrated H_2SO_4 and formic acid at room temperature. When heated, the polymer is also completely soluble in pyridine and quinoline. Extraction yielded two fractions, one soluble in acetone (36%), one insoluble in acetone (64%), the latter being soluble in dimethyl formamide. When the polymer is heated in argon, no loss in weight occurs up to $100^\circ C$. The loss in weight is 5.2% at $150^\circ C$, and 20.2% at $200^\circ C$. It was found that heating did not cause a progressive polymer decomposition; because the loss in weight did not surpass a certain limit for any temperature. The infrared spectra of the two fractions differ only by their absorption intensity. Another paper will describe the infrared spectra. The linear structure of polymer

$Cl - \left[\text{---} \text{C}_6\text{H}_4 \text{---} \text{C}_6\text{H}_4 \text{---} N = N - NH \text{---} \right]_{n-1} \text{---} \text{C}_6\text{H}_4 \text{---} \text{C}_6\text{H}_4 \text{---} NH_2$ with the end groups $-Cl$ and $-NH_2$ in the ratio 1:1 and a mean molecular weight of ~ 4000 can

be assumed on the basis of the infrared spectra, the anomalous course of viscosity curves (see Fig. 2), and the results of elementary analysis.

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Aromatic polytriazenes

28178
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B124/B110

The anomalous course of viscosity curves proves the rigidity of polymer molecules and their tendency toward association. The epr spectra of aromatic polytriazenes are 7 - 8 oe wide symmetrical singlets with rather high intensity with the g-factor of free electron and superposition of a 30 - 40 oe wide signal with the same g-factor. The total concentration of paramagnetic particles of the unfractionated polymer and the polymer soluble in acetone fluctuated in the order of 10^{19} . Cooling down to 77°K does not change the character of the epr signal; its intensity rises, however, according to the Curie law. The epr spectra prove that the con-junction along the chain is preserved and unpaired electrons in basic state are present. Magnetic susceptibility was $0.55 \cdot 10^{-6}$ per gram. The aromatic polytriazenes are electrical insulators at room temperature; electrical conductivity rises, however, considerably with temperature. $E = 1$ ev, $\sigma_0 \sim 50 \text{ ohm}^{-1} \cdot \text{cm}^{-1}$ at room temperature; $E = 1.3$ ev, $\sigma_0 \sim 6 \cdot 10^6 \text{ ohm}^{-1} \cdot \text{cm}^{-1}$ at 200°C was found for the values of equation $\sigma = \sigma_0 \exp(E/kT)$. There are 3 figures and 9 references: 7 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: G. Marwel, G. Hartzell, J. Amer. Chem. Soc., 81, 448, 1959; Card 3/4

Aromatic polytriazenes

28-78
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B124/B110

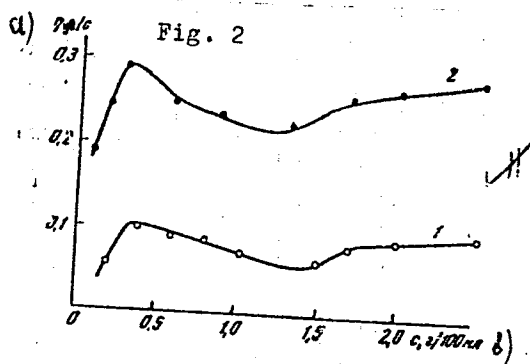
J. E. Stewart, M. Hellman, J. Res. Nat. Bur. Standards, 50, 125, 1958.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics AS USSR)

SUBMITTED: November 14, 1960

Fig. 2. Dependence of intrinsic viscosity of the solutions of aromatic polytriazenes on the concentration (solvent: dimethyl formamide, Ubbelohde viscosimeter, temperature $20 \pm 0.02^\circ\text{C}$). (1) Fraction of polymer soluble in acetone; (2) fraction insoluble in acetone

Legend: (a) η_{intr}/c ; (b) c , g/100 ml.



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29738
S/190/61/003/011/008/016
B110/B101

AUTHORS: Moshkovskiy, Yu. Sh., Kostrova, N. D., Berlin, A. A.

TITLE: Polymers with conjugated bonds and heteroatoms in the conjugated chain. XVIII. Some peculiarities of infrared spectra of polymers with conjugated bonds

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 11, 1961, 1669 - 1672

TEXT: The authors studied the infrared spectra of linear and trimeric carbochain polymers with linear conjugated chain for peculiarities connected with the appearance of epr spectra. By means of MKI-11 (IKS-11) and MK-14 (IKS-14) spectrometers, they investigated: yellow polyphenyl acetylene (PPA) thermally polymerized in Ar atmosphere at 150°C (I) ($\bar{M}_n = 1200$); PPA after additional thermal treatment at 300 (II) and 400°C (III); unmeltable and unsoluble trimeric block copolymer from PPA and p-diethynyl benzene (PDEB) (IV); polyazophenylene (PAP) (V) ($\bar{M}_n = 650$) and its trimeric block copolymer with PDEB (VI); poly-PDEB (VII). and the

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B110/B101

Polymers with conjugated bonds...

copolymer from styrene and PDEB (VIII). As had been expected according to the macromolecule structure suggested by A. A. Berlin et al. (Ref. 5: Vysokomolek. soved., 1, 1817, 1959), the fundamental types of oscillations of the benzene ring were observed. The absorption of the background is not due to scattering but due to the properties of polymer macromolecules. With a change in color of the PPA from yellow to black (I - III) and to the dark-brown copolymer from PPA and PDEB (IV), the following background absorptions were obtained in the region of 1300 cm^{-1} : 35% (I); 46% (II); 75% (III); 88% (IV). They behave in parallel to the concentration of paramagnetic particles, which indicates equal structural causes for the two phenomena. The background absorption of VIII shows that sufficient conjugation is required therefor. The infrared spectra of PAP fractions with linear system of conjugated benzene rings ($n = 8 - 10$) showed no background absorption. Graphitelike II, III, and IV with uninterrupted conjugation chain, VII and VI have strong continuous background absorption in the range $1600 - 700\text{ cm}^{-1}$. Hence, the background effect is connected with the formation of planar structures in conjugated systems. The authors suppose that the phenomena observed are due to strong dislocation of π -electrons in the polymer chains with systems of conjugated bonds. This

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Polymers with conjugated bonds...

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is suggested by the parallelism between the intensity of continuous absorption in the infrared range of the spectrum and the concentration of unpaired electrons in the polymer sample. This, however, will have to be confirmed by further investigations. There are 3 figures and 6 Soviet references.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics AS USSR)

SUBMITTED: December 23, 1960

Card 3/3

S/190/61/003/012/012/012
B110/B147

AUTHORS: Parini, V. P., Kazakova, Z. S., Berlin, A. A.

TITLE: Polymers with conjugate bonds and heteroatoms in the conjugate chain. XIX. Some properties of aniline black

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 12, 1961, 1870 - 1873

TEXT: The formulas for aniline black by A. G. Green (Ber., 46, 33, 1913) have been doubted by I. S. Ioffe and Ye. M. Metrikina (Ref. 2: ZhRPFkhO, 62, 1101, 1115). Aniline black probably consists of polymers or oligomers with repeated quinone diimine groupings. V. P. Parini found a connection between the energy of the lowest unfilled level, the activation energy of conductivity, and other properties of aromatics having a benzene ring and accumulation of quinoid rings in the molecule. In quinone diimine groupings with nitrogen atoms unsaturated with respect to coordination, the molecule should be excited even more easily. According to

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Polymers with conjugate bonds ...

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A. G. Green and W. Johnson, 16 g of aniline, 48 milliliters of 31% HCl were dissolved in 200 milliliters of H₂O, and mixed with a solution of 24 g of K₂Cr₂O₇ in 600 milliliters of H₂O. After 1 hr, this solution was heated to 70°C and sucked off. The lye was obtained by boiling with NH₃. The complex-bound chromium was removed by treating with HCl (1.19) at 40 and 80°C, dissociating of hydrochloride by aqueous NH₃, dissolving in acetic acid, and washing with 2% NaCl solution. The authors found 14.22% of N in the lye (Green: 13.85%). In hydrochloride, they found 2.90% of N and 6.83% of Cl, which well agreed with Green's data. The results, however, contradicted the formula for aniline black given in the literature. The authors studied: (1) the substance obtained at first and not extracted with alcohol; (2) Cr-containing hydrochloride obtained after alcoholic extraction; (3) the corresponding lye; (4) the hydrochloride obtained after Cr removal and reprecipitation from acetic acid; (5) the lye obtained therefrom. The magnetic properties were examined by X-ray spectroscopy (wavelength = 3.2 cm). All samples showed a wide epr line (~450 oersteds)

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Polymers with conjugate bonds ...

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B110/B147

corresponding to the epr spectrum of chromium oxide. This epr line had a narrow singlet (11 - 13 oersteds) having a g-factor of 2.00 and an integral intensity of $10^{19} - 10^{20}$ paramagnetic particles per 1 gram. Paramagnetic absorption decreased somewhat with Cr removal by HCl. After several hours' heating at 200°C, the wide line vanished in all samples, which proves its dependence on structure. The narrow epr signal was observed several times in conjugated bonds. Between 20 and 80°C, the electrical conductivity is subject to the equation for semiconductors, $\sigma = \sigma_0 \cdot \exp(-E/kT)$ (Table). In hydrochloride, it is essentially higher. At normal temperature and with a steep course of the curve $\sigma = f(T)$, low E and σ_0 values lead to conductivities comparatively high for organic substances. At 40°C, the sample not purified from low-molecular fractions by alcoholic extraction showed a salient point of the conductivity-versus-temperature curve and a sharp drop of activation energy and rise in conductivity. Catalytic activity was concluded from the magnetic and semiconductor properties. All samples, especially the hydrochlorides and the Cr-containing samples, catalyzed the

✓

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Polymers with conjugate bonds ...

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B110/B147

H₂O₂ decomposition, which is not done by chromium oxide. R. I. Yevgrafova ✓
is thanked for assistance with experiments, Ye. I. Balabanov for measuring
the conductivity, V. L. Tal'roze for placing his laboratory at disposal.
There are 1 figure, 1 table, and 9 references: 7 Soviet and 2 non-Soviet.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical
Physics AS USSR)

SUBMITTED: January 20, 1961

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Polymers with conjugate bonds ...

S/190/61/003/012/012/012
B110/B147

Table. Electrical conductivity of various aniline-black samples.
Legend: (1) substance; (2) initial substance before alcoholic extraction; (3) Cr-containing lye; (4) the same, hydrochloride; (5) lye after Cr removal; (6) in the range of; (7) at.

Электропроводность различных образцов АЧ

① Вещество	Е, Ω	$\frac{1}{\rho}$, $\frac{\text{cm}^2}{\Omega \cdot \text{cm}}$	σ 300°K, $\frac{1}{\Omega \cdot \text{cm}}$
② Первоначальное вещество до экстракции спиртом	0,45* 0,20**	10^2 $10^{1,5}$ **	10^{-5} $10^{-1,5}$ ***
③ Хромсодержащий АЧ, ос-нованно	0,81	$10^{0,9}$	10^{-12}
④ То же, хлоргидрат	0,35	10^{-1}	10^{-8}
⑤ По удалении хрома, осно-вано	0,61	$10^{-1,6}$	10^{-12}
⑥ То же, хлоргидрат	0,17	$10^{-2,2}$	10^{-8}

* В интервале 20—40°. ** В интервале 40—80°. *** При 350°K.

Card 5/5

20361

15.8114

also 1164, 1043, 1143

S/020/61/136/005/022/032
B101/B206

AUTHORS: Berlin, A. A., Boguslavskiy, L. I., Burshteyn, R. Kh.,
Matveyeva, N. G., Sherle, A. I., and Shurmovskaya, N. A.

TITLE: Some electrophysical properties of polymer complexes of
tetraethylene cyanide with metals

PERIODICAL: Doklady Akademii nauk SSSR, v. 136, no. 5, 1961, 1127-1129

TEXT: The authors deal with the chelate compounds between tetraethylene cyanide and metals. The infusibility and insolubility of these compounds led to the proposal that coatings and plastics be manufactured from them (Ref. 3). The electrophysical properties of polymeric chelate films chemically bonded to metals, which were obtained by treatment of copper, iron, and nickel sheets with tetraethylene-cyanide vapor, were studied in this paper. The degreased and, in some cases, also electropolished or etched metal foils were exposed to tetraethylene-cyanide vapor at 10^{-5} mm Hg and 150 to 400°C. A film firmly sticking to the metal developed, the thickness of which was calculated from the specific gravity of the

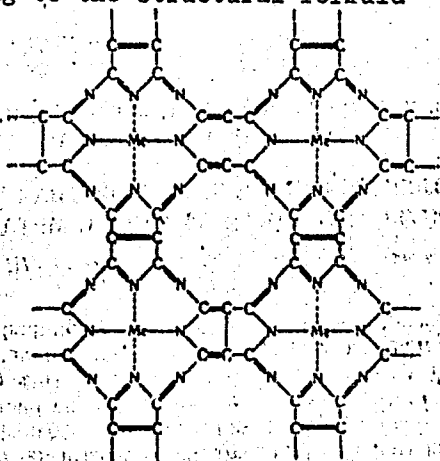
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B101/B206

Some electrophysical properties ...

polymer and from the weight of the film as being $5 \cdot 10^{-6} - 3 \cdot 10^{-5}$ cm. (Owing to the poor combustibility of the chelate film, microanalysis produced too low carbon values). The infrared spectra of the copper complex, taken by Yu. Sh. Moshkovskiy and N. D. Kostrova, showed the complete absence of maxima in the range $800 - 2300 \text{ cm}^{-1}$. A "parquet" structure of the polymer according to the structural formula



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Some electrophysical properties ...

S/020/61/136/005/022/032
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is concluded therefrom. The electrophysical properties of the films were checked by means of alternating current of 200 cps - 0.2 Mc/sec. The metal covered by the film was immersed in mercury so that the film formed the dielectric of a capacitor, the plates of which consisted of the metal and of mercury. Measurements were made at 10^{-5} mm Hg because the presence of air influenced the results. This effect needs further research. The specific conductivity σ , the film capacitance and its temperature dependence, duration of heating, and the method of metal-surface treatment were determined. The following data are given for films of iron obtained after 3 hr heating at 250°C in tetraethylene-cyanide vapor: film thickness $3 \cdot 10^{-6}$ cm; $\sigma = 3 \cdot 10^{-9}$ ohm $^{-1}$.cm $^{-1}$; effective dielectric constant ϵ (at 3000 cps) = 7. After further 3 hr of heating, σ increased to $3 \cdot 10^{-8}$ ohm $^{-1}$.cm $^{-1}$, and ϵ to 36. Increase of temperature from 250 to 450°C . and heating for 10 hr produced the following values: $\sigma = 5 \cdot 10^{-8} - 5 \cdot 10^{-6}$ ohm $^{-1}$.cm $^{-1}$, $\epsilon = 70$. The sign of the emf indicates that the film possesses p-type conductivity. $\log \sigma = f(10^3/T)$ is represented in Fig. 2. Measurements between -40 and $+220^{\circ}\text{C}$ yielded two linear sections.

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Some electrophysical properties ...

The first lies between -40 and $+30^{\circ}\text{C}$ and corresponds to an activation energy of from 0.07 to 0.12 ev, while the second (30 to 250°C) corresponds to an activation energy of from 0.21 to 0.28 ev. The function represented is similar to that obtained for semiconductors with impurity conductivity. R and ϵ as functions of the logarithm of the frequency ν between 400 cps and 0.2 Mc/sec were also measured. Results are shown in Fig. 3. It is noted that R and the film capacitance decrease with increasing voltage when a constant voltage is applied. When a direct current is conducted through an alcoholic solution of copper sulfate, metallic copper firmly adhering to the film is deposited on the polymer film formed on iron. The high ϵ values indicate that the polarization of conductive macromolecules could be in question. The authors are preparing a study on the complex dielectric constant at higher frequencies. There are 4 figures and 3 Soviet-bloc references.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics, Academy of Sciences USSR). Institut elektrokhemii Akademii nauk SSSR (Institute of Electrochemistry, Academy of Sciences USSR)

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20361

Some electrophysical properties ...

S/020/61/136/005/022/032
B10.1/B206

PRESENTED: August 13, 1960, by A. N. Frumkin, Academician

SUBMITTED: August 13, 1960

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Some electrophysical properties ...

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B101/B206

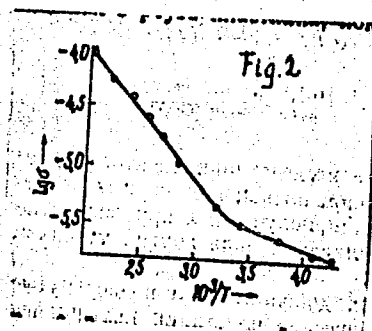


Fig. 2

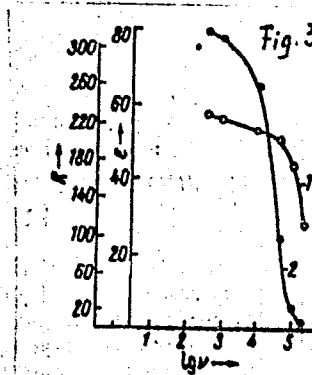


Fig. 3

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28671

S/020/61/140/002/016/023

B103/B101

AUTHORS: Berlin, A. A., and Matveyeva, N. G.

TITLE: Synthesis and some properties of polytetracyano ethylene

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 2, 1961, 368-370

TEXT: Contrary to published data according to which tetra-substituted ethylene derivatives do not polymerize owing to a large steric hindrance, the authors found that tetracyano ethylene (TCE) can be polymerized at 200°C under the action of certain organic initiators. These open the C≡N bond, and convert it to >C=NH which is polymerizable. Ethanol proved the strongest initiator (polymer yield, 43.5%), followed by aniline (27%), phenol (25.3%), urea (17.5%), triethylamine (13%), pyridine (8.7%), and (NH₄)HCO₃ (1.0%). Without an initiator but under otherwise equal conditions, TCE is polymerizable only with a yield of ~2% under the same conditions. In this case, traces of water or other impurities probably act as initiators. The polymer yield increased with increasing aniline mixture. If the yield was only 2% at 0.5 mole% of aniline, it reached 27% at 1.7 mole%, and 36% at 4.4 mole%. Polymerization is completed

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Synthesis and some properties ...

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within 0.5 hr. The fact that the polymer yield does not depend on the reaction time is probably due to a stop of the macromolecule growth owing to the formation of inactive molecular complexes of TCE and to the increasing amount of the polymeric heterocyclic compound. Polytetracyano ethylene produced in the presence of aniline and kept in vacuo at 200°C for 20 hr remains unchanged when kept at 300°C for 4 hr. At 350°C, 9.6% of the weight is lost during the first 15 min. No further change of the polymer occurs at this temperature. A further rise of temperature destroys the polymer appreciably. The weight loss is 38.5% at 400°C, 62.5% at 450°C, and at 500°C the polymer is entirely destroyed. The electrophysical properties of polytetracyano ethylenes are similar to those of the polymeric chelates of tetragyano ethylene. The polymers exhibit an increased conductivity of 10^{-7} to 10^{-9} ohm $^{-1}$.cm $^{-1}$. Their activation energy is 7-13 kcal/mole. The polymers obtained show a narrow epr signal of high intensity with a distance between the maxima of 4-6 oe and a g factor of 2, but without a hyperfine structure. The concentration of the paramagnetic particles is 10^{20} - 10^{21} per gram. The broad lines are asymmetric, their branches extend over some thousand in some polymers. The data available at present are not sufficient for

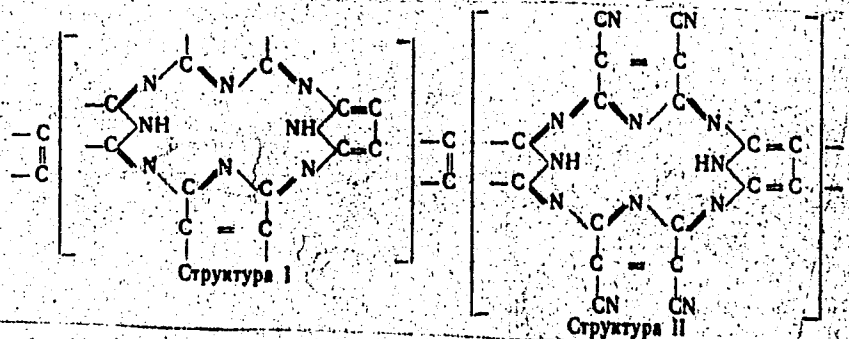
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Synthesis and some properties ...

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defining the structure of the TCE polymers. It is, however, assumed that, like in the synthesis of phthalocyanines, macromolecules are formed owing to the formation of interlinked azoporphyrine rings:



There are 3 figures, 2 tables, and 7 references: 3 Soviet and 4 non-Soviet. The three references to English-language publications read as follows: U. Biroumshaw, T. W. Tayler, J. Chem. Soc., 1954, 931; R. C. Card 3/4

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B103/B101

Synthesis and some properties ...

Houtz, Text. Res. J., 20, 786 (1950); N. Grassil, J. C. McNeill, J. Pol. Sci., 27, 207 (1958).

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR)

PRESENTED: March 16, 1961, by N. N. Semenov, Academician

SUBMITTED: March 16, 1961

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15.8150

28733
S/020/61/140/003/014/020
B103/B101

AUTHORS: Berlin, A. A., and Razvodovskiy, Ye. F.

TITLE: Synthesis of polymers with charged heteroatoms in macro-
molecule chains: Onium polymerization

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 3, 1961,
598 - 600

TEXT: The authors investigated the possibility of obtaining "onium polymers" from 4-chloro pyridine (XII) containing a nucleophilic nitrogen atom and a mobile halogen. Pure XII was heated at 50 - 60°C, or stored at 20°C; thus, a yellowish brown polymer was produced, and neither atoms nor groups were split off from the monomer. Unlike XII-monomer, the polymer contains 90 % of titratable ohlorida ions. The degree of polymerization amounts to 8 - 14 ($M_n = 912 - 1600$). The infrared spectra of the synthesized products showed an intensified absorption in the range of 802 cm^{-1} , as compared with pyridyl pyridine chloride. The authors assume this to be a para-substitution. Furthermore, the maxima missing in XII appeared between 1360 and 1310 cm^{-1} . They correspond to the bonds $-C-N$. The frequencies.

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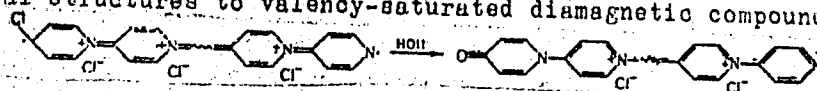
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B103/B101

Synthesis of polymers with...

The polymer of XII, carefully cleaned of pyridine, is very hard. It keeps its yellowish brown color when stored, is soluble in water, aqueous methanol, and pyridine, and insoluble in alcohol, acetone, dioxane, dimethyl aniline, and hydrocarbons. Polypyridinium chloride synthesized from XII and pyridine (volume ratio 4 : 1) is soluble in water, pyridine, methyl, and, a little less, in ethyl alcohol. Exposed to light, the brown polymer becomes dark green. Its decomposition starts at 160 - 165°C. Fresh polymer, cleaned of monomer and kept dry, shows narrow signals of electron paramagnetic resonance, bearing analogy to those of macromolecules with a system of conjugate bonds. The content of paramagnetic particles is $3.8 \cdot 10^{18}$ per g, the q-factor = 2.00, the width of the signal is 6 oersteds. This paramagnetism is probably due to high-molecular fractions containing stable macroradicals. In polymers kept in aqueous solution and precipitated by acetone, there were no epr signals. Moreover, they contain much less titratable chlorine. Under these conditions, both the final halogen and the salt bonds are hydrolyzed. Thus, (4-pyridyl)-4-pyridone-(4)-links are formed. Such a molecular reconstruction finally leads to a transition of macroradical structures to valency-saturated diamagnetic compounds

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Synthesis of polymers with...

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The principle of onium polymerization can also be used to produce various copolymers, e. g., π -dipyridyl with chloranil in toluene solution, or in fusion at 130°C. The dark-brown product is soluble in methanol, pyridine, and water. If it is dissolved in concentrated H_2SO_4 , HCl is set free. The epr signal of the polymer is symmetric and corresponds to $5 \cdot 10^{18}$ paramagnetic particles per g. The g-factor is 2.00, the width of the signal is 8 oersteds. The onium compounds have elevated electrical conductivity, which rapidly increases with rising temperature. The authors thank Ye. I. Balabanov for determining the electric properties. There are 2 tables and 6 references: 3 Soviet and 3 non-Soviet.

PRESENTED: May 6, 1961, by V. N. Kondrat'yev, Academician

SUBMITTED: April 12, 1961

Card 4/4

S/882/62/000/002/055/100
A059/A126

AUTHORS: Baranovskaya, N.B., Berlin, A.A., Zakharova, M.Z., Mizikin, A.I.,
Zil'berman, E.N.

TITLE: A method of curing organosilicon-polymer-based compositions

SOURCE: Sbornik izobreteniy; plastmassy i sinteticheskiye smoly. no. 2.
Kom. po delam izobr. i otkrytiy. Moscow, TzBTI, 1962, 30 - 31 [Au-
thor's certificate no. 126115, Cl. 12o, 26o3 (appl. no. 571577 of
April 20, 1957)]

TEXT: A mixture of the ethyl ester of orthosilicic acid or its hydrolysates
with organotin compounds of the general formula $R_2Sn(OCOR)_2$ is suggested as a
curing agent for the mentioned compounds and their mixtures, where R is an ali-
phatic radical with 1 to 8 carbon atoms. To a mixture containing 30 - 70% of a
mineral filler (TiO_2 , SiO_2 , ZnO , etc.), a 3% solution of tin dibutyl acetate in
the ethyl ester of orthosilicic acid or its hydrolysates (1:1) is added. The mix-
ture begins to thicken after 2 - 3 h, and becomes a rubber-like substance after
24 h, with a tensile strength of 30 - 50 kg/cm² and a specific elongation of 150 -

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A method of curing organosilicon-polymer-based

S/882/62/000/002/055/100
A059/A126

300%. Thus, curing at room temperature becomes feasible.

[Abstracter's note: Essentially complete translation]

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Card 2/2

S/019/62/000/001/045/056
A154/A126

AUTHORS: Shmurak, I. L., Uzina, R. V., Berlin, A. A.

TITLE: A method of increasing the adhesion of rubber to textiles

PERIODICAL: Byulleten' izobreteniy, no. 1, 1962, 63

TEXT: Class 39b, 518. No. 144019 (720854/23 of March 10, 1961). A method of increasing the adhesion of rubber to textiles by impregnating the latter with solutions of copolymers of natural and synthetic rubbers with polyamides, distinguished by the fact that, in order to widen the raw-material base and increase the adhesion, from 1 to 15% of sulfochlorinated polyethylene is added to the rubber mixes. 

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35265

S/064/62/000/002/003/008
B101/B144

15.9000

AUTHORS:

Berlin, A. A., Kronman, A. G., Yanovskiy, D. M., Kargin,
V. A.

TITLE:

Impact resistant materials on the basis of graft copolymers
of polyvinyl-chloride with elastomers

PERIODICAL:

Khimicheskaya promyshlennost', no. 2, 1962, 20-24

TEXT: A survey of publications concerning an increase of the impact strength of polyvinyl-chloride (PVC) by copolymerization with methyl-vinyl pyridine rubbers and nitrile rubbers is given and data from the authors own studies are repeated. In addition, the Huggins constant K' for copolymers of PVC with CK MBT-15 (SK MVP-15), CKH-18 (SKN-18), and CKH-26 (SKN-26), calculated from the intrinsic viscosity is mentioned. The intrinsic viscosity was determined in cyclohexanone.

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Impact resistant materials ...

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Solution investigated	$[\eta]$	K'
SK MVP-15	0.8	0.346
PVC	0.835	0.433
Reaction product	0.72	0.617
Mechanical mixture	0.8	0.356
SKN-18	1.78	0.656
PVC	1.01	0.248
Reaction product	0.915	0.397
Mechanical mixture	1.14	0.272
SKN-26	2.38	0.511
PVC	1.01	0.248
Reaction product	0.95	0.644
Mechanical mixture	1.085	0.491

The lower intrinsic viscosity of the copolymers is explained by their inferior solubility. The high K' is caused by a branched structure. When copolymerizing PVC with nitrile rubber or methyl-vinyl pyridine rubber, reaction between the Cl of PVC and the N of nitrile and pyridine,

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Impact resistant materials ...

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B101/B144

respectively, sets in under formation of tridimensional structures. There are 4 figures, 3 tables, and 19 references: 9 Soviet and 10 non-Soviet. The four most recent references to English-language publications read as follows: L. C. Bateman, Ind. Eng. Chem., no. 4, 704 (1957); G. Bloomfield, P. Swift, J. Appl. Chem., no. 11, 609 (1955); J. E. Gordon, C. C. Turrell, J. Org. Chem., 24, 269 (1958); S. E. Bolam, Austral. Plastics, 10, no. 107, 18 (1954).

Card 3/3

X

S/019/62/000/002/043/0
A152/A125

AUTHORS: Kronman, A. G., Yanovskiy, D. M., Derlin, A. A., Kargin, V. A.

TITLE: Method of producing plastics

PERIODICAL: Byulleten' izobreteniy, no. 2, 1952, 38

TEXT: Class 39b, 22-01. No. 144282 (699914/23 of March 2, 1951). A method of producing plastics based on chloride and butadiene-nitrile rubbers containing acrylonitrile groups, differing from others in that in order to raise the specific resilience and reduce rubber expenditure, butadiene-nitrile rubbers containing from 12 to 30% of acrylonitrile groups are used.

Card 1/1